

Applicant: NISHIOKA *et al.*  
Serial No: 09/957,471  
Filing Date: September 21, 2001  
Page: 2 of 13

**Amendments to the Claims:**

This listing of claims replaces all prior versions, and listings, of claims in this application.

1. (Withdrawn) A variable-optical-characteristic optical element characterized by using at least two selected from the group consisting of electrostatic force, electromagnetic force, a piezoelectric effect, magnetostriction, a fluid pressure, a magnetic field, an electromagnetic wave, a temperature change, and a photomechanical effect.
2. (Withdrawn) A variable mirror characterized by using at least two selected from the group consisting of electrostatic force, electromagnetic force, a piezoelectric effect, magnetostriction, a fluid pressure, a magnetic field, an electromagnetic wave, a temperature change, and a photomechanical effect.
3. (Withdrawn) A variable-focus lens characterized by using at least two selected from the group consisting of electrostatic force, electromagnetic force, a piezoelectric effect, magnetostriction, a fluid pressure, a magnetic field, an electromagnetic wave, a temperature change, and a photomechanical effect.
4. (Withdrawn) A variable-optical-characteristic optical element capable of achieving high-precision optical deflection by combined use of two or more different driving methods to change optical deflection thereof, wherein each driving method is capable of achieving a different optical deflection change.
5. (Currently Amended) A ~~variable-focus~~ variable-optical-characteristic optical unit, comprising:

a variable-focus optical element having a fluid portion, and an electrode adjacent to said fluid portion; and

a power source unit and a driving circuit for driving said ~~variable-focus~~ optical element variable-optical-characteristic optical unit, wherein:

Applicant: NISHIOKA *et al.*  
Serial No: 09/957,471  
Filing Date: September 21, 2001  
Page: 3 of 13

said power source unit or driving circuit includes a booster member that is connected to the power source unit and generates a voltage necessary in said driving circuit, and said variable-focus-optical-element variable-optical-characteristic optical unit is capable of achieving optical deflection.

6. (Currently Amended) A variable-focus variable-optical-characteristic optical unit according to claim 5, wherein electrostatic force or piezoelectric effect is used for driving said variable-focus-optical-element variable-optical-characteristic optical unit.

7. (Withdrawn) A variable-optical-characteristic optical element comprising a deformable optical surface and a member for creating a magnetic field, wherein a substrate of said optical surface is made of a magnetostrictive material, and said member is capable of changing an intensity of the magnetic field.

8. (Withdrawn) A variable-optical-characteristic mirror that uses a magnetostrictive material and comprising a deformable optical surface.

9. (Withdrawn) A variable-optical-characteristic lens comprises a deformable optical surface and a member for creating a magnetic field, wherein a substrate of said optical surface is made of a magnetostrictive material, and said member is capable of changing an intensity of the magnetic field.

10. (Withdrawn) A variable-optical-characteristic optical element comprising a deformable optical surface, wherein a transparent member for covering a whole deformable portion thereof is provided near said optical surface.

11. (Withdrawn) A variable-optical-characteristic optical element according to claim 10 which is a variable mirror or a unifocus mirror.

Applicant: NISHIOKA *et al.*  
Serial No: 09/957,471  
Filing Date: September 21, 2001  
Page: 4 of 13

12. (Withdrawn) A variable-optical-characteristic optical element comprising a light source for driving said variable-optical-characteristic optical element, wherein a substance having a photomechanical effect is used for deformation of an optical surface, and optical deflection changes by deformation of the optical surface.
13. (Withdrawn) A variable-focus lens comprising a light source for driving said varifocal lens, wherein a substance having a photomechanical effect is used for deformation of an optical surface, and optical deflection changes by deformation of the optical surface.
14. (Withdrawn) A variable mirror characterized by using a photomechanical effect.
15. (Withdrawn) A variable-optical-characteristic optical element characterized by having at least two different kinds of light sources and using a photomechanical effect.
16. (Withdrawn) An optical apparatus comprising a variable-optical –characteristic optical element, wherein said variable-optical-characteristic optical element comprises an optical surface, and a space that faces a whole portion thereof that is to be deformed is closed up with a transparent member and a mechanical member, which is characterized in that the variable-optical-characteristic optical element is a variable mirror.
17. (Withdrawn) An optical-apparatus comprising a variable-optical-characteristic optical element, wherein said variable-optical-characteristic optical element comprises an optical surface, and a space that faces a whole portion thereof that is to be deformed is airtightly closed up with a transparent member and a mechanical member, which is characterized in that the variable-optical-characteristic optical element is a variable mirror.
18. (Withdrawn) An optical apparatus according to claim 16, which is characterized by using an air-permeable mechanical member or transparent member.
19. (Canceled)

Applicant: NISHIOKA *et al.*  
Serial No: 09/957,471  
Filing Date: September 21, 2001  
Page: 5 of 13

20. (Withdrawn) An optical apparatus according to claim 18, which is characterized in that the variable-optical-characteristic optical element is a variable mirror.

21. (Currently Amended) A ~~variable focus~~ variable-optical-characteristic optical unit having a deformable optical surface, comprising:

a ~~variable focus element~~ variable-optical-characteristic optical unit having said deformable optical surface; and

a control system for driving said ~~variable focus optical element~~ variable-optical-characteristic optical unit, wherein said ~~variable focus optical element~~ variable-optical-characteristic optical unit includes a fluid portion for deforming said deformable optical surface and an electrode adjacent to said fluid portion, and said control system includes a booster member that is connected to a power source, and for applying a voltage necessary for driving said ~~variable focus optical element~~ variable-optical-characteristic optical unit.

22. (Currently Amended) The ~~variable focus~~ variable-optical-characteristic optical unit according to claim 21, which is a varifocal lens or a variable mirror.

23. (Canceled)

24. (Currently Amended) An imaging system, comprising an image pickup device and an imaging optical system for which a ~~variable focus optical element~~ variable-optical-characteristic optical unit as recited in any one of claims 5, 21, and 22 is used.

25. (Currently Amended) An imaging system, comprising  
a variable-focus optical element,  
a power source unit and a driving circuit for driving said variable-focus optical element,  
a computing unit,  
an image pickup device, and

Applicant: NISHIOKA *et al.*  
Serial No: 09/957,471  
Filing Date: September 21, 2001  
Page: 6 of 13

an imaging optical system, wherein said power source unit or said driving circuit includes a booster member that is connected to a power source, and that generates a voltage necessary in said driving circuit,

said variable-focus optical element is capable of achieving optical deflection,

said computing unit examines a high-frequency component of each image picked up while being defocused, and the position where the high-frequency component reaches a maximum is determined to be an in-focus position, and

said variable-focus optical element is used for autofocusing of said imaging optical system.

26. (Currently Amended) A imaging system, comprising  
a variable-focus optical element having a deformable optical surface,  
a control system for driving said variable-focus optical element,  
a computing unit,  
an image pickup device, and  
an imaging optical system, wherein said control system includes a booster member that is connected to a power source, and operable to for applying a voltage necessary for driving said variable-focus optical element,

said computing unit examines a high-frequency component of each image picked up while being defocused, and the position where the high-frequency component reaches a maximum is determined to be an in-focus position, and

said variable-focus optical element is used for autofocusing of said imaging optical system.

27. (Withdrawn) The variable-optical-characteristic optical element according to claim 10 or 11, wherein said transparent member is a lens.

28. (Withdrawn) An imaging system, comprising an imaging optical system including a variable-optical-characteristic optical element as recited in claim 10 or 11.

Applicant: NISHIOKA *et al.*  
Serial No: 09/957,471  
Filing Date: September 21, 2001  
Page: 7 of 13

29. (Withdrawn) An optical apparatus, comprising a variable-optical-characteristic optical element having a deformable optical surface, wherein a space including a whole deformable portion is closed up with a transparent member and a mechanical member.
30. (Withdrawn) An optical apparatus, comprising a variable-optical-characteristic optical element having a deformable optical surface, wherein a space including a whole deformable portion is airtightly closed up with a transparent member and a mechanical member.
31. (Withdrawn) The optical apparatus according to any one of claims 16, 17 and 30, wherein said transparent member has a lens action.
32. (Withdrawn) The imaging system according to claim 16 or 17, which comprises an image pickup device and an imaging optical system including said variable-optical-characteristic optical element, wherein autofocusing or zooming is carried out by deformation of said optical surface.
33. (Withdrawn) The imaging system according to any one of claims 16, 17 and 30, which comprises an image pickup device and an imaging optical system including said variable-optical-characteristic optical element, wherein a contrast type of autofocusing is carried out by deformation of said optical surface.
34. (Withdrawn) The optical apparatus according to any one of claims 16, 17 or 30, which comprises a display device.
35. (Withdrawn) The optical apparatus according to any one of claims 16, 17 or 30, which comprises a lookup table for deforming the optical surface of said variable-optical-characteristic optical element.

Applicant: NISHIOKA *et al.*  
Serial No: 09/957,471  
Filing Date: September 21, 2001  
Page: 8 of 13

36. (Withdrawn) The optical apparatus according to any one of claims 16, 17 or 30, which comprises a plurality of said variable-optical-characteristic optical elements, wherein zooming is carried out.

37. (Withdrawn) The optical apparatus according to any one of claims 16, 17 or 30, which is a cellular phone.

38.-39. (Canceled)

40. (Currently Amended) A cellular phone having said imaging system as recited in ~~any one of~~ claims 24, 25, and 26.

41. (New) A cellular phone having said imaging system as recited in claims 25 or 26.